

The Science of Diversity and its Relevance in a Fast Changing World

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Why am I here?

Especially since I'm:

White - Northern European
Male
Q-Cleared
Ph.D.
US born
Exit-seating capable

My Background

- Star Wars
- Novel fusion device
- Novel diesel engine for DoD
- Hydrogen Program
- P&G
- Biological threat reduction & DHS

Questions

- Is support for diversity the moral thing to do or the economically right thing to do
- Do you have a bumper sticker: “I brake for synchronicity”?
- Diversity on an assembly line?
- Have a drink, kill the weak brain cells and get smarter?
- What is your identity? Where do you store the catsup?
- Fall of the house of experts
- Homeland security
 - Molecular dynamics to epidemics
 - How to capture human behavior in a crisis?
- How to build a Democracy?

What does the research say?

Analytical

- Genetic algorithms ("natural selection")
- Iterated Games (Game Theory)
- Ant models

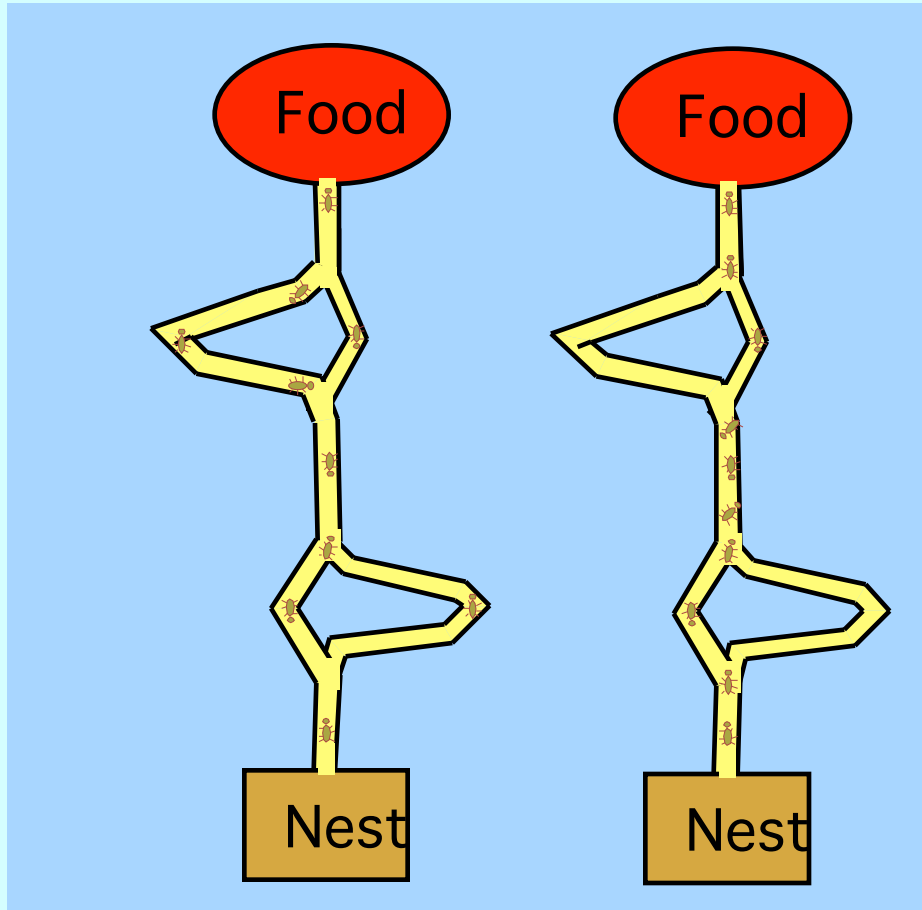
Ants Solving “HARD” problems

Provide an ant colony with multiple paths between their nest and food...



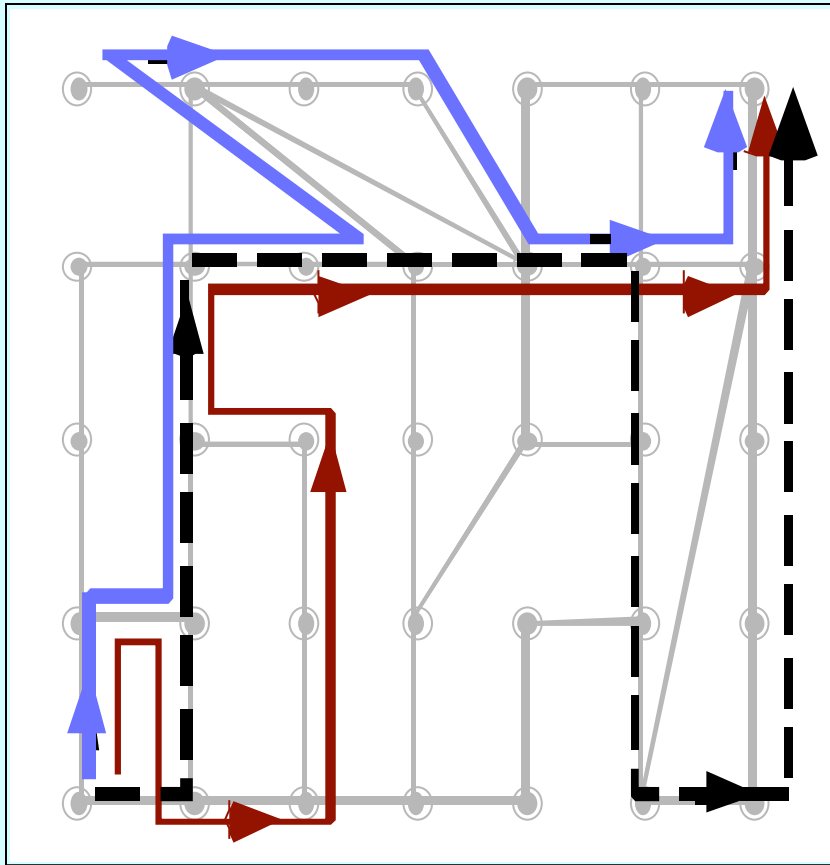
Ants Solving “HARD” problems

The ant colony (and individuals) finds the shortest path

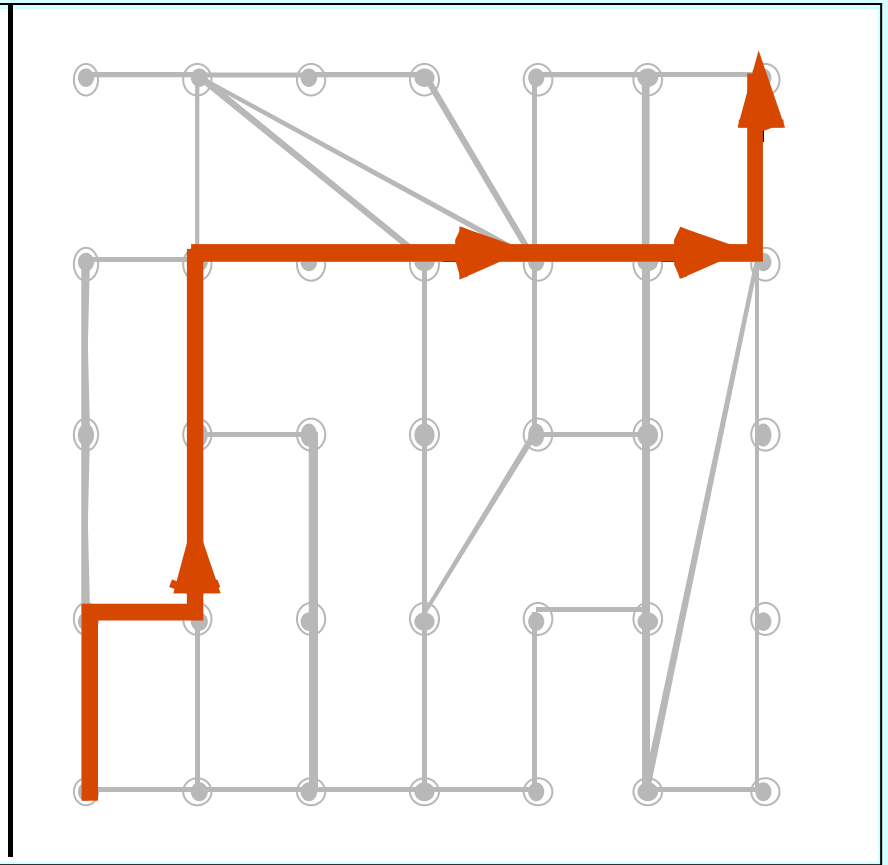


How does it work?

How ants find the Shortest path



Paths of three ants

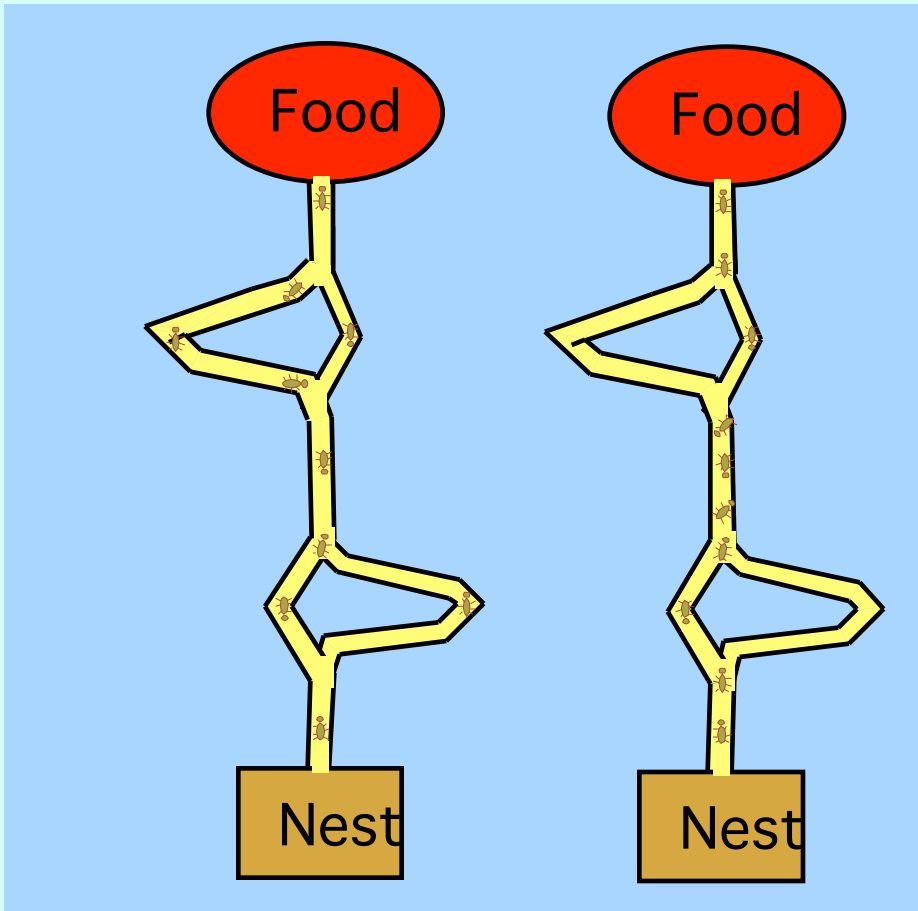


Collective path

Diverse pheromone trails (with or without evaporation)

Ants Solving “HARD” problems

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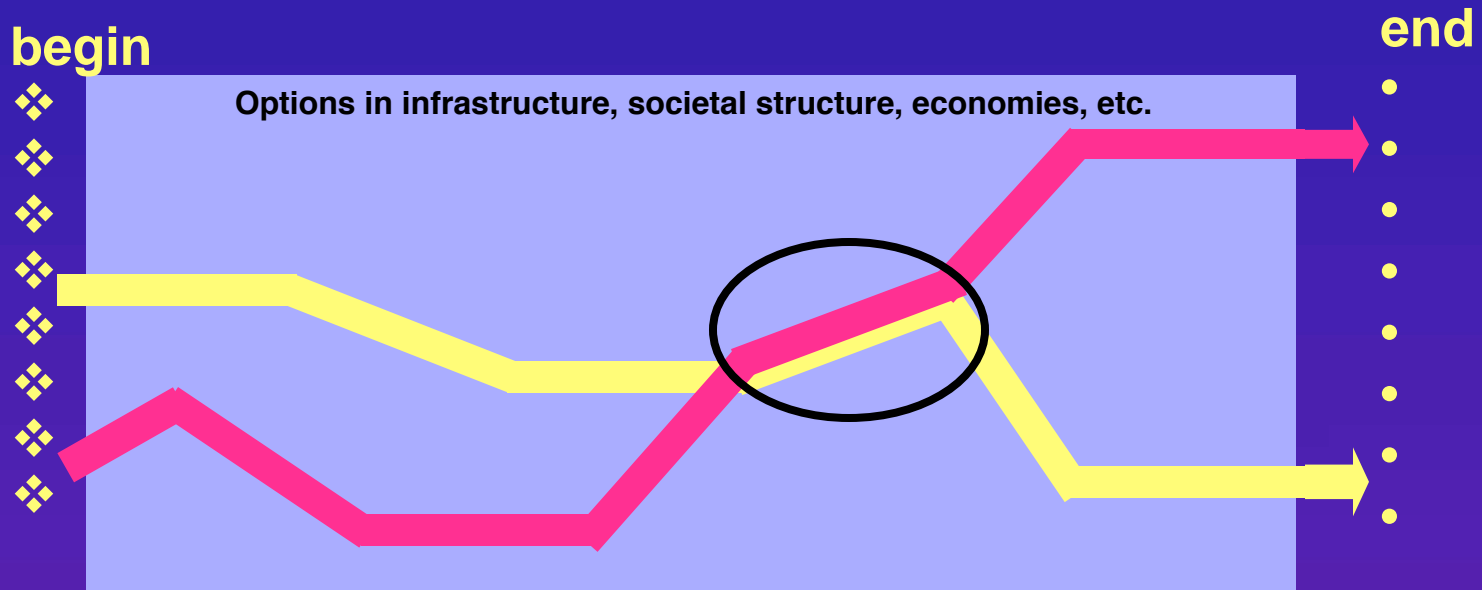
How does it work?

Only works for groups of diverse ants

Collectives in complex environments

In complex domains:

- Beginning points differ
- End points differ
- But partial paths can overlay and find synergy



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Emperical

Harrington at Brown: small investment groups

One Business Argument

70% of our work knowledge is from informal sources

Two year, \$1.6 million DOL study of Motorola, Boeing, Ford, etc.

\$100-120 billion a year is spent on formal training programs,

Yet in complex situations, how is the “best training” determined?

Why are these informal sources helpful?

Individual problem solving in a common environment.

Diversity gives unique perspectives.

Individuals contribute to something much greater than they perceive.

How do we tap the huge collective resources?

Investment in enabling Diversity activates informal learning.

Individuals expression, Listen to others, Mixing communities.

What do you mean by diversity?

Diversity = Ethnicity?

My research

Diverse collectives not only perform better but they are also more robust to misinformation

Diversity has a sweet spot

Competition, optimization or stress all reduce diversity

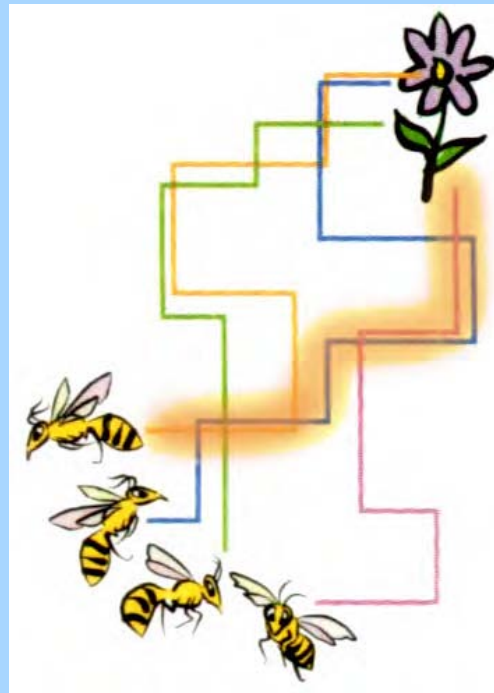
Three Mechanisms for Performance of Collective

Selection



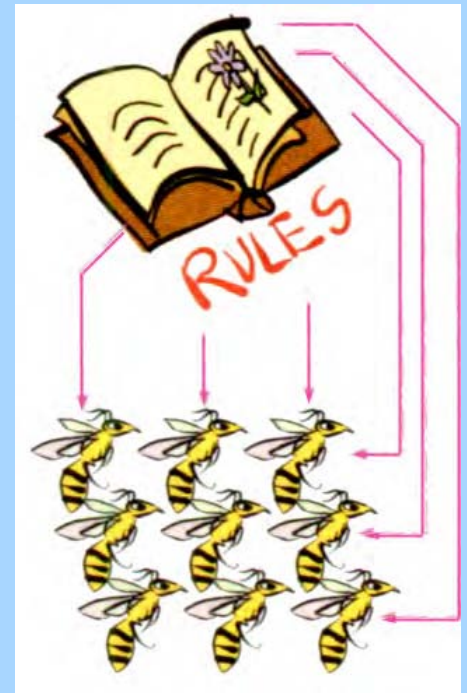
Major
loss of
resources

Synergy



Sweet Spot

Optimization



But not
robust

Diversity - source of conflict or synergy?

Diversity leads to synergy when collectives have:

- **Common goals**
- **Common worldview (agreement on options), but with different preferences or goals**
- **Common identity**

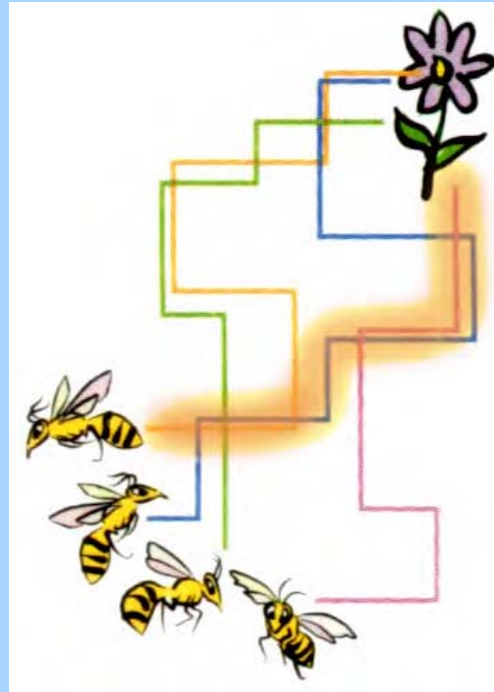
Otherwise, diversity can lead to competition and conflict

Why not optimize directly?

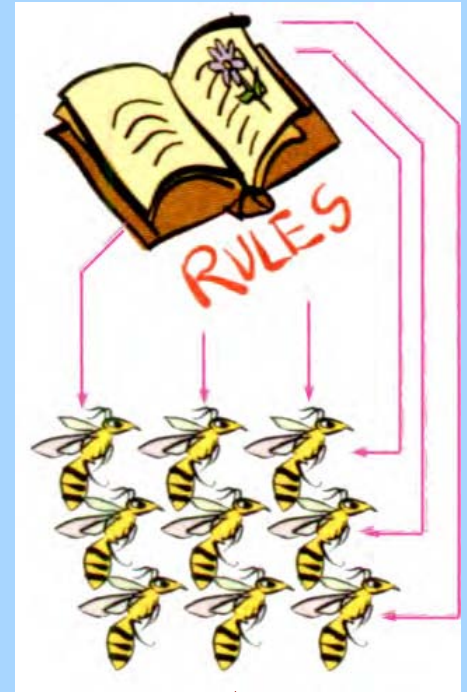
Selection



Synergy



Optimization



X

Complexity Barrier

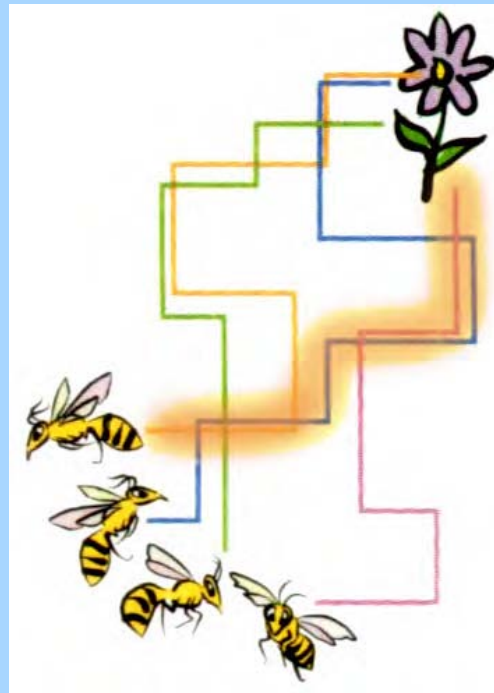
What's the effect of change/stress?

Selection

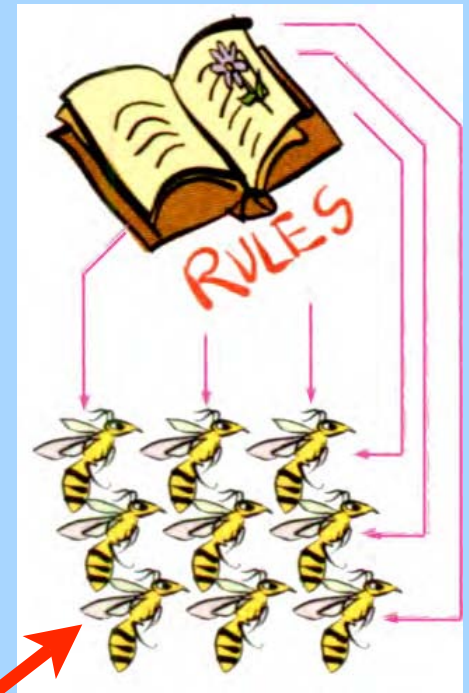


**Individual
survival**

Synergy



Optimization

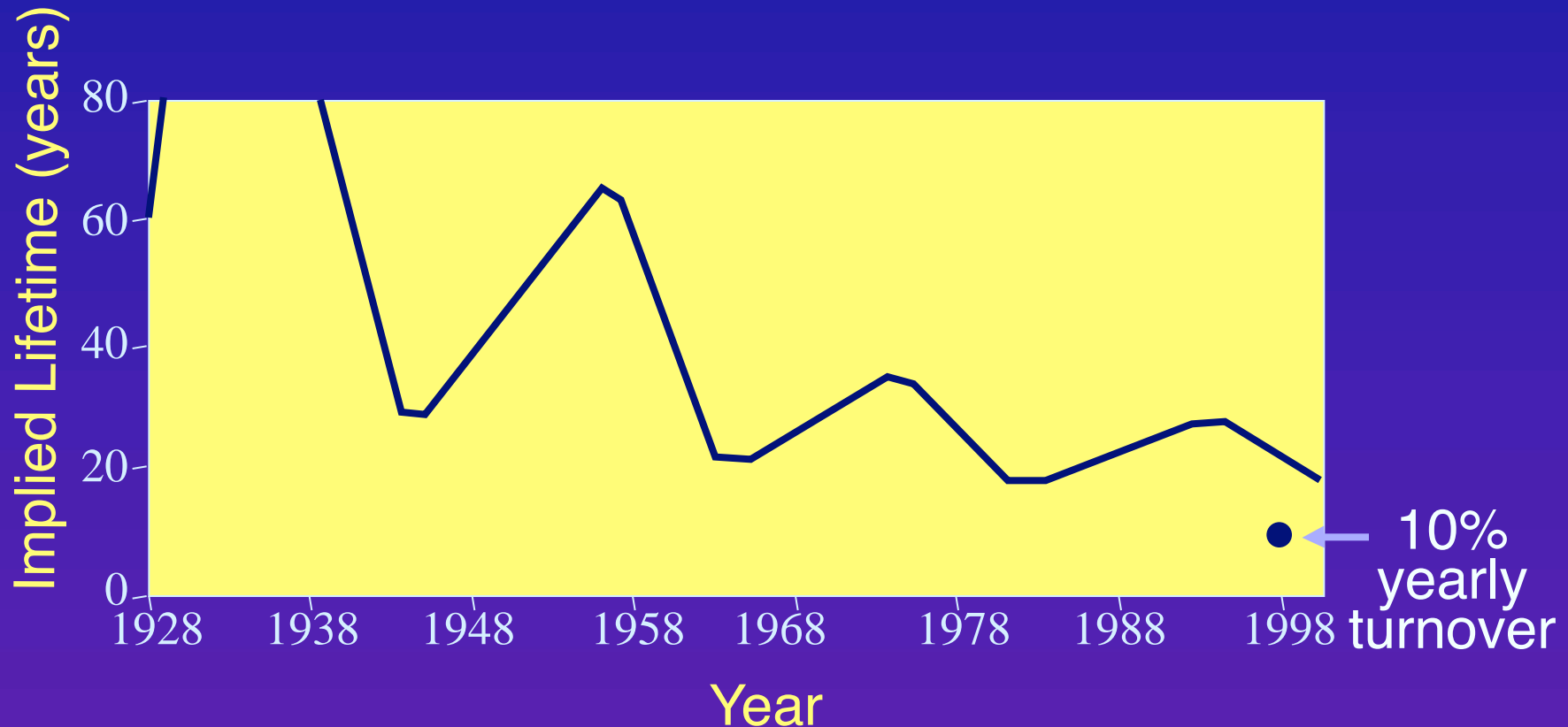


**Peer copying -
Group survival**

From the
Sweet Spot

Why worry about change?

- Average Lifetime of S&P 500 Companies
- From *Creative Destruction*
- by R. Foster and S. Kaplan



The Impact of Change

- Are you busier this year than last?
- Are you using more information sources than you did last year?
- Do you know more people than ever before, but less quality ones?
- Things that you thought would never change - are changing?
- Are you more uncertain about the future?

Sustainable strategies in fast changing times

Keep it simple - complex strategies will fail

Focus on process, not product

Enable, manage and sustain diversity

Consider universal ethics

Recognize behavioral lock-in in clients and partners

Increased individual “rationality” may lead to destabilization and chaotic performance

Improve your response to herd behavior ... Resist social copying under stress

Instead, increase your sources of diverse information

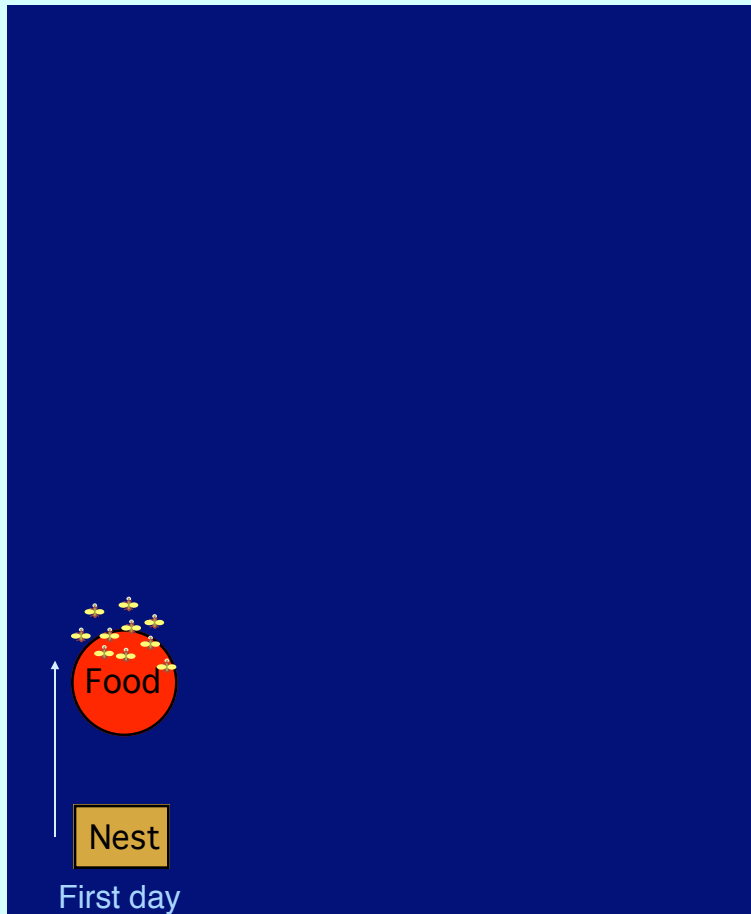


Test Questions

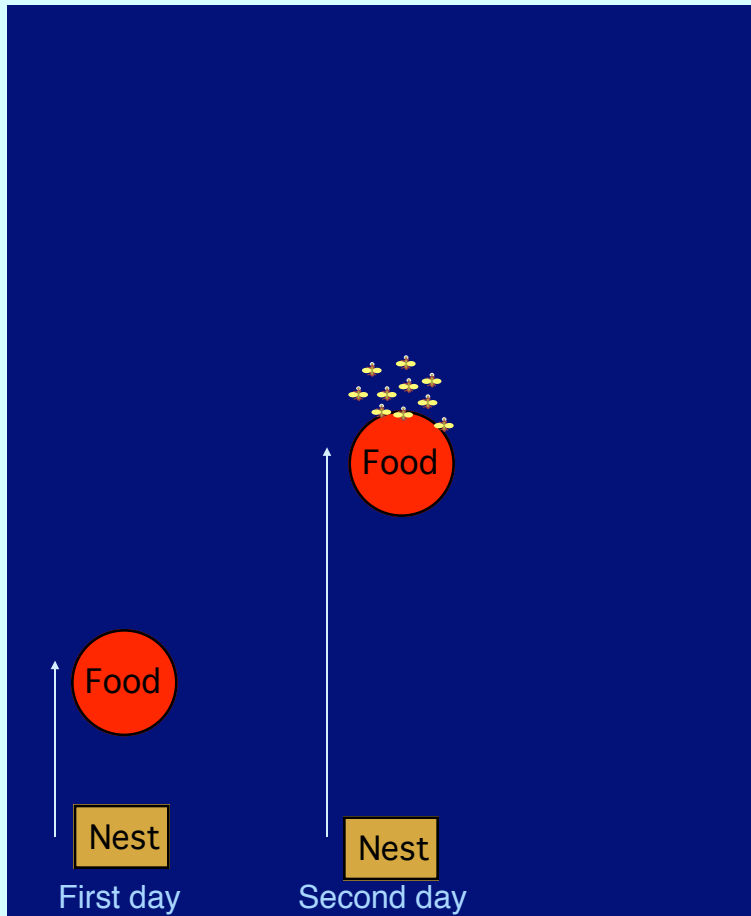
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- The Complexity Barrier also applies to discrimination
-
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Researching Bee Talk

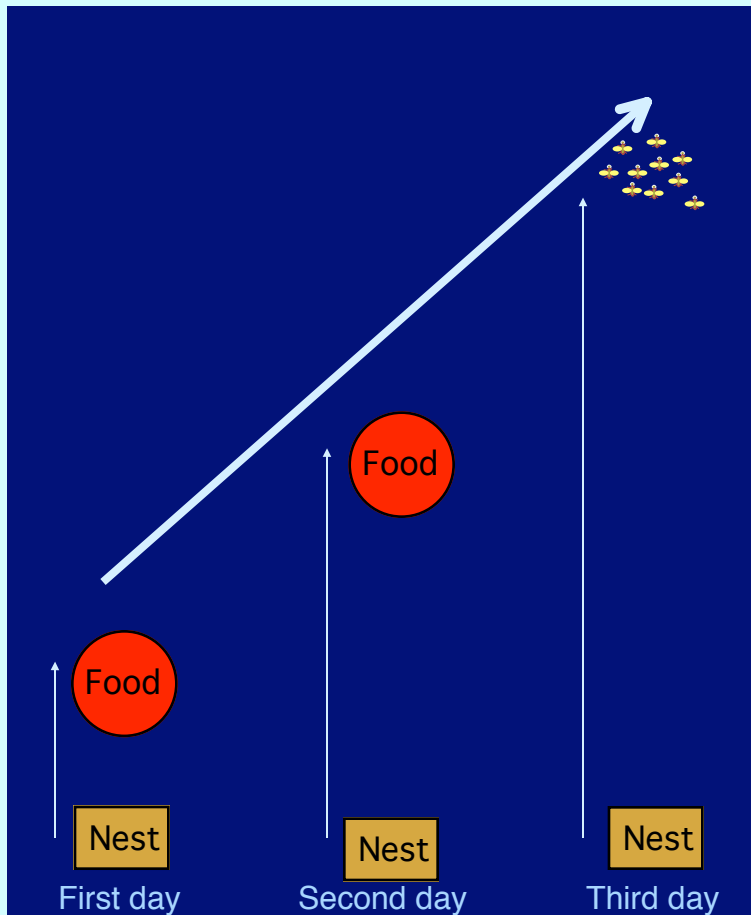
Don't underestimate collectives



Researching Bee Talk



Researching Bee Talk



Where is the prediction taking place?

Where is memory located?

Bee memory - 1 week

Bee life - 6 week.

Hive memory - 12 weeks.

Why are social insects so disturbing?

All hive functions are emergent properties

Why aren't we as impressed with human collectives?